Forgotten Rivers: Riparian Areas

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I'm going to talk a bit about what has happened to the rivers, and I will try to address why I think it matters. Most of us here work in the water resources field, most of us enjoy recreation, most of us go to the river, and so most of us feel some sort of compassion toward the river. I think that is hard-wired into us as human species. I am strongly supportive of wild rivers, and I think that derives from a kind of visceral connection to rivers. There is this feeling you get when you are close to flowing water; it is a connection with the universe. It is a feeling that young people need to be led to deliberately in order to feel a sense of balance. In the coming generations, life is not going to be all about electronic devices; we are part of nature and occasionally we need to be reminded of that. Today I am going to use the Gila River as a case study.

Has everyone seen a Colorado River supply/demand curve? If you have, you know that we are playing it pretty close to the line with water scarcity and we have been doing so for some time. We are confronting a need to either find new sources of water, different ways of relating to water, or ways of doing the same things but using less water. But, I also think that an equally difficult part is keeping these rivers alive. In the face of increasing demands, we are increasing withdrawals. Rivers do have thresholds; there are limits to what we can safely abstract from rivers and we ought to pay attention to those limits.

I have been involved in a Rio Chama Flow Optimization Project, in which we are scientifically trying to determine what the flow benchmarks are, or in other words, points on the hydrograph throughout the year that we have to hit in order to maintain something that functions as a river.

We want a river that obeys the laws of physics and not just the water code. Our southwestern predecessors, the Mimbrenos, recognized that we are all tied together–the economics, ecology, fish, terrestrial species, and our human society are all tied together. What happened to our natural rivers in New Mexico is development. Water development is our legacy now, and I believe we are at a point where we must choose between heavy engineering projects, or whether we are going to go a bit softer with the way that we develop water in the future.

When Kearney marched into Santa Fe in 1847, he began a process of Americanizing New Mexico. The result was that our forests, rangelands, minerals, and soils were, according to the policies of the time, to be turned into dollars. Figure 1 shows the Rio Embudo in 1907 where forest clearing was done in order to build the Rio Grande Western and Santa Fe railroads.

Figure 1. The Big Barbecue - Rio Embudo, 1907

We know the logic behind reservoirs and we have gotten a great deal of benefit from them. But there have also been some adverse effects of those engineering developments. Congress in 1948, at our behest, decided that the Rio Grande was going to be 600 feet wide and 300,000 jetty jets were built to try to maintain our legal notion of what the boundaries of the river were (Fig. 2). As part of this development process, we wanted efficiency, maximum utilization, and maximum economic return. If the interest is simply efficiency, what type of channel is more efficient than a perfect trapezoidal channel for conveying water? We have also treated rivers badly both in terms of our land-use practices and by dumping our waste products into the river where due to the physical flow processes, waste moves out of our area and into somebody else's.

Figure 2. 300,000 Jetty Jacks

Figure 3 shows hydrologic effects of the Rio Grande Project. It comes from a book called *Dams and Rivers: A Primer on the Downstream Effects of Dams*. The blue bars represent the annual total discharge into the Rio Grande by year. The dark blue bars indicate when Elephant Butte and Caballo reservoirs were developed. The fact is that these represent a crossing of thresholds where the Rio Grande below El Paso could no longer maintain its integrity as a life support system for nature. When you dam a river, you drop the sediments out of it, and the water released from the dam is sediment starved. As the water first reaches below a dam, the river will scour out the area, and then being sediment starved, it will pick up sediment. This creates a process of narrowing and degrading; the elevation of the river will go down, the river will get faster, and the river will become simpler. Somewhere down the line, where that sediment has been picked up and reworked, it will fall out and be deposited again.

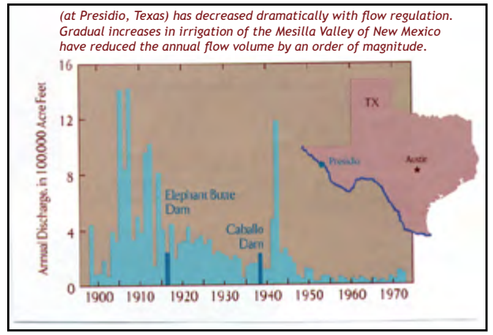

Figure 3. Hydrologic Effects of the "Rio Grande Project"

Figure 4 is a 1905 photo of San Acacia in the Middle Rio Grande. You can see some of the features including a river bend that is fairly natural and sinuous. In the background you can see where water has leaked out of the river and has created wetlands. In fact, this was pretty good duck hunting country at one time. You can see that the nature of the river in response of flood disturbances is that floodplains stay pretty well swept off. The year, 1905, was one of the years after a large flood, and you see from the photo that it was swept clean. On this clean slate, riparian vegetation will emerge. Figure 5 shows the exact same spot, except that the channel has aggradated 25 feet. The vegetation is mostly monotypic Tamarisk and it isn't going anywhere because we are not allowing floods to come disturb the vegetation and create new habitat. I also like this picture because you can see the results of development: the railroad, the levees, the riverside drain, and the low-flow conveyance channel. We have made the river conform to a less natural, more engineered design. It is not a river that is going to go anywhere inconvenient for us.

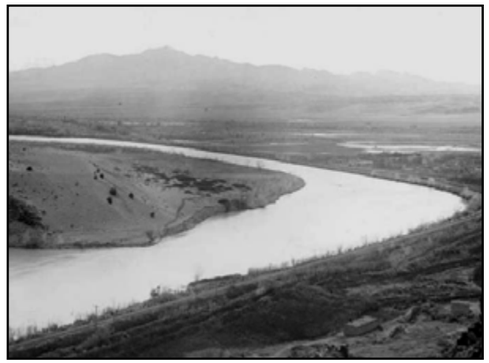

Figure 4. San Acacia, 1905

Figure 5. San Acacia, 1989

The graphic in Figure 6 shows the channel aggradation process. It is a cross section of the Rio Grande below El Paso. You can see where the river bed was after the last flood event in 1942. You can also see where it was in successive years up to 1974. On the right side you see a canyon that is contributing sediments and during the monsoon season, it will put a lot of sediment into the river. However, the altered hydrology has not allowed those sediments to be removed and that is the reason why the river is progressively aggrading.

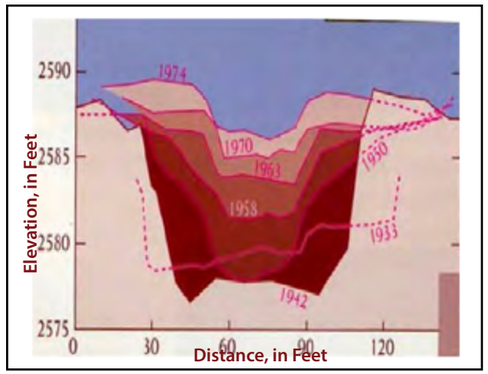

Figure 6. Channel Aggradation

Figure 7 depicts the Forgotten River. We're seeing a process of controlling the river that is alternately causing degradation and then aggradation. This has transformed the ecology and created adverse economic impacts as well. The degradation process will take the water tables down with it, so you don't have healthy habitat developing. In this aggraded type system you have increased flooding. When Caballo was closed in the 1930s, El Paso suddenly experienced floods that the river channel had normally had the capacity to handle. Then, there is also a roughly three-mile-wide patch of Tamarisk bosque that isn't natural. You'll also notice that there is no identifiable channel here.

Figure 7. Forgotten River

Figure 8 depicts a dead river.

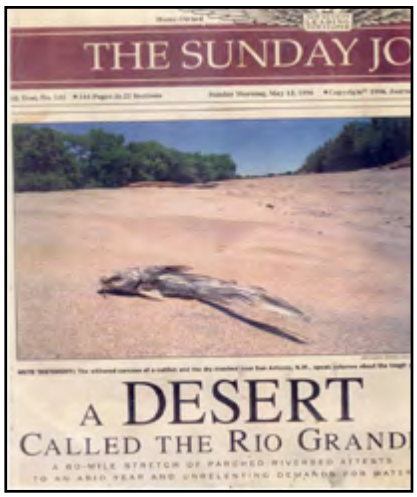

Figure 8. The *Albuquerque Journal* front page photo of a dead river.

With the last five minutes of my talk, I want to talk about a transition from this old development paradigm. In the past we used steam cranes and mule-driven scrapers to engineer straight canals. At this conference, we are talking about innovations to try to secure the real water future that we want to have in New Mexico.

The still free-flowing Gila, as State Engineer Scott Verhines mentioned earlier today, is the subject of a process to decide how the Gila River might best meet the water supply needs of southwestern New Mexico. Fifteen potential projects have been submitted to the Interstate Stream Commission, three of which are diversions. The agency seems to prefer a diversion very similar to the old 1890s water development paradigm. In such a project you divert water from the river, pipe it down the valley into off-channel storage, and pump it once more over the divide and into the neighboring basin. This water then gets distributed to prospective users along the way, perhaps Silver City, Deming, and/or some of the area farms.

Twelve non-diversion alternatives have also been suggested. Scott described how these include: watershed restoration projects, water conservation of both the agricultural and municipal sectors, and water reuse projects. These are the sorts of projects that have been identified in the past 20 to 25 years as concepts for "stretching" existing water supply. These projects are getting some consideration as alternatives to new diversion for additional funding. The amount of $66 million is available for funding the selected project or suite of projects. A diversion, the "New Mexico Unit of the Central Arizona Project," could get us somewhere on the order of an additional $30 to $60 million to help with construction. But, based on experience with the Buckman Direct Diversion and Albuquerque Drinking Water projects of similar magnitude, we are probably looking at $300 to $500 million of today's dollars in construction costs for less than 14,000 acre-feet of water, and we have not yet identified the end users.

It looks to me like this is a classic confrontation between the old way of doing water business and a new way of doing water business. I suggest that the Gila Decision is where we can bring our creative instincts together with the lessons we can glean from modern water management in the other to build something that will both serve the local people and the wild river.

If I were a Cliff Gila Valley irrigator, I would prefer to be served not by a reservoir that would release additional water, but by more reliable infrastructure. This could be a diversion that is more reliable, but more what I'd really want is reliable base flow. And improved late-season flows might be possible if ISC could bring itself to invest in a program of watershed restoration. Watershed restoration—forest thinning primarily—could attenuate the runoff, reduce the instances of wildfires and debris flows that threaten southwestern New Mexico communities. Restoration that promotes water retention on the landscape longer, could restore historic base flow and improving water quality.

In closing, I get a sense that we are in the process of changing our minds about the proper treatment of rivers. Aldo Leopold suggested, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." Managing the river based upon economic criteria or legal criteria only is not going to get us very far into the future. Make no mistake, we are making decisions today about the future of our rivers. Once a river is degraded by engineering processes, the damage may not be not reversible.

The choice, ultimately, if we are proactive, is between another forgotten river or a healthy river that could support our economic aspirations, the complex water system on which all lives depend and this desert called the Rio Grande.